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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/240,632	02/01/1999	YUTAKA MURAKAMI	402/568	7584

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EXAMINER

FAN, CHIEH M

ART UNIT	PAPER NUMBER
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2634

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DATE MAILED: 07/25/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/240,632

Applicant(s)

MURAKAMI ET AL.

Examiner

Chieh M Fan

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 May 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-13,33,37-40,42-49,51 and 53-73 is/are pending in the application.
- 4a) Of the above claim(s) 60-73 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1 and 3-13 is/are allowed.
- 6) ☒ Claim(s) 33,37-40,42-49,51 and 53-59 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 01 February 1999 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

DETAILED ACTION

This Office Action is in response to the Request for Continued Examination (RCE) filed on 5/9/03.

The applicants are reminded that the non-elected claims 60-73 are still pending in the application. Claims 60-73 need to be canceled before allowance.

Claim Objections

1. Claims 42-47 and 53-59 are objected to because of the following informalities:

Regarding claim 42, the limitation "the second modulation signal is phase shift keying (PSK) modulation" should be changed to -- the second modulation signal is obtained by phase shift keying (PSK) modulation -- or -- the second modulation signal is a phase shift keying (PSK) modulation signal --.

Claims 43-47 should be changed similarly.

Regarding claims 53-59, "one of claims 49 or 51" recited in the first line of each of claims 53, 56, 57, and 59 should be changed to -- one of the claims 49 and 51 -- or -- claims 49 or 51 --.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 45 and 56 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The first modulation in the present invention is at least 8-signal-point modulation. The claimed limitation "the first modulation signal is QPSK" clearly does not have support in the specification since QPSK is a 4-signal-point modulation.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claim 33 is rejected under 35 U.S.C. 102(b) as being anticipated by Furuya (US Patent 5,577,087).

Furuya teaches a transmission apparatus comprising:

first means for regularly (60 and 30 in Fig. 4; also see Fig. 2 and col. 3, lines 3-6, the blocks numbered 1, 2 of a signal frame are using QPSK and the blocks numbered 3, 4 are using 16QAM) subjecting an input digital signal (input to 70 in Fig. 4) to first modulation (40 in Fig. 4) and second modulation (50 in Fig. 4) to convert the input signal into pair of a baseband I signal and a baseband Q signal (note that the outputs of 16QAM and QPSK have I and Q components), the first modulation being at least 8-point-signal modulation, and the second modulation being phase shift keying; and

second means for outputting the pair of the baseband I signal and the baseband Q signal (the outputs of 40 and 50 are sent to radio section 20 for converting to radio frequency and then sent to the antenna 10 for transmitting).

6. Claims 33, 37-40, 42-47, 49, 51 and 53-58 are rejected under 35 U.S.C. 102(b) as being anticipated by Seki et al. (EP 0734132 A2, provided by the applicants in IDS received 8/2/02, PTO Paper # 8).

Regarding claim 33, Seki et al. teaches a transmission apparatus comprising:

first means (see 11 in Fig. 3, also see col. 10, lines 16-20) for regularly subjecting an input digital signal to first modulation and second modulation to convert the input signal into pair of a baseband I signal and a baseband Q signal, the first modulation being at least 8-point-signal modulation, and the second modulation being phase shift

keying (the first modulation is 16QAM and the second modulation is QPSK, also see col. 18, lines 39-49 and col. 7, lines 10-11).

second means (see 14 in Fig. 3) for outputting the pair of the baseband I signal and the baseband Q signal.

Regarding claim 37, Seki et al. also teaches that the variations in amplitude and phase of a channel are detected from the QPSK signal (col. 11, lines 6-7; col. 13, lines 4-13).

Regarding claims 38 and 39, Seki et al. teaches a modulation method for modulating an input digital signal into a multi-value symbol stream, the modulation method comprising:

generating a first multi-value modulation signal having first multi-value symbols with a first modulator; generating a second modulation signal containing second multi-value symbols by using a second modulator which are to be used as a pilot symbol estimating at least one of (1) a channel distortion and (2) a frequency offset for demodulating said first multi-value modulation signal in a receiver; and inserting said second multi-value symbols into said first multi-value symbols such that the resulting multi-value symbols constitute said multi-value symbol stream. (See col. 7, lines 46-58; col. 10, lines 16-22; col. 8, line 57 through col. 9, line 10; col. 13, lines 4-13; and col. 16, lines 50-58. Note that since the QPSK signal is used to detect the amplitude offset and the phase offset, the QPSK signal is considered to be a pilot signal.)

Regarding claim 40, Seki et al. also teaches that the second modulation signal, i.e., QPSK signal, is differentially encoded (col. 1, lines 20-35).

Regarding claims 42-44, Seki et al. further teaches the second modulation signal may be any type of PSK signals (col. 18, lines 43-46).

Regarding claim 45-47, Seki et al. further teaches that the first modulation signal is a 16-QAM signal (col. 7, line 11). Seki et al. also teaches that QAM may be replaced by another modulation method or multiple modulation methods (col. 18, lines 46-49). The first modulation signal of Seki et al. therefore can be a QPSK signal.

Regarding claim 49, Seki et al. teaches a transmission apparatus comprising a first multi-value modulation system for subjecting an input digital signal to first modulation and outputting a first quadrature baseband signal, a second modulation system for subjecting an input digital signal to a second modulation and outputting a second quadrature baseband signal, wherein the second quadrature baseband signal regularly is inserted as a pilot signal into the first quadrature baseband signal wherein said second quadrature signal is used for estimating a frequency offset and a channel distortion, and wherein amplitude and phase distortion amounts of a receiver are derived from the second quadrature baseband signal. (See col. 7, lines 46-58; col. 10, lines 16-22; col. 8, line 57 through col. 9, line 10; col. 13, lines 4-13; and col. 16, lines 50-58. Note that since the QPSK signal is used to detect the amplitude offset and the phase offset, the QPSK signal is considered to be a pilot signal.)

Regarding claim 51, Seki et al. also teaches that the second modulation signal, i.e., QPSK signal, is differentially encoded (col. 1, lines 20-35).

Regarding claims 53-55, Seki et al. further teaches the second modulation signal may be any type of PSK signals (col. 18, lines 43-46).

Regarding claim 56-58, Seki et al. further teaches that the first modulation signal is a 16-QAM signal (col. 7, line 11). Seki et al. also teaches that QAM may be replaced by another modulation method or multiple modulation methods (col. 18, lines 46-49). The first modulation signal of Seki et al. therefore can be a QPSK signal.

Claim Rejections - 35 USC § 103

7. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

8. Claims 48 and 59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Seki et al. (EP 0734132 A2, provided by the applicants in IDS received 8/2/02, PTO Paper # 8).

Regarding claim 48, Seki et al. teaches the claimed invention including that the first modulation signal is a 16 QAM signal and the second modulation signal is PSK signal (see the rationale applied to claims 33 and 42-47 above). Seki et al. does not particularly teach that a distance between signal points of the 16 QAM in an I-Q plane is equal to a given value (such as 2 or in a range of 0.9-1.5) times a distance between signal points of the PSK in the I-Q plane. However, it is clear the distance between signal points of the 16QAM or QPSK in the I-Q plane in the system of Seki et al. is merely an arbitrary design choice, dictated by system conditions such as how noisy the

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system is. When there is more noise, the distance between signal points would need to be wider to reduce error.

Regarding claim 59, Seki et al. teaches the claimed invention including that the first modulation signal is a 16 QAM signal and the second modulation signal is PSK signal (see the rationale applied to claims 49 and 53-58 above). Seki et al. does not particularly teach that a distance between signal points of the 16 QAM in an I-Q plane is equal to a given value (such as 2 or in a range of 0.9-1.5) times a distance between signal points of the PSK in the I-Q plane. However, it is clear the distance between signal points of the 16QAM or QPSK in the I-Q plane in the system of Seki et al. is merely an arbitrary design choice, dictated by system conditions such as how noisy the system is. When there is more noise, the distance between signal points would need to be wider to reduce error.

9. Claim 37 is rejected under 35 U.S.C. 103(a) as being unpatentable over Furuya (US Patent 5,577,087) in view of Alamouti et al. (US Patent 5,933,421).

As described above (see the rationale applied to claim 33), Furuya teaches the claimed subject matter except the symbols provided by the phase shifting comprises a pilot symbols for estimating at one of (1) a transmission path distortion and (2) a frequency offset.

Alamouti et al. teaches a communication system, wherein pilot symbols are inserted in the QPSK symbols to be transmitted (col. 15, lines 42-48). The pilot symbols are used to provide an accurate representation of the channel response, i.e. the

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amplitude and phase distortion introduced by the communication characteristics (col. 12, lines 58-63).

It is known in the art that the channel distortion needs to be estimated and removed or compensated in the receiver such the received signal can be accurately demodulated to recover the transmitted data. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide pilot symbols in the QPSK signal of Furuya to estimate the channel distortion, such that the received signal can be accurately demodulated to recover the transmitted data at the receiver.

10. Claims 38, 39, 42-44, 46-49, 53-55 and 57-59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Furuya (US Patent 5,577,087) in view of Alamouti et al. (US Patent 5,933,421).

Regarding claims 38, 39 and 49, Furuya teaches a transmission apparatus comprising a first multi-value modulation system (40 in Fig. 4) for subjecting an input digital signal to a first modulation and outputting a quadrature baseband signal, a second modulation system (50 in Fig. 4) for subjecting an input digital signal to a second modulation and outputting a second quadrature baseband signal, wherein the second quadrature baseband signal is regularly inserted into the first quadrature baseband signal (note that the outputs of 16QAM and QPSK have I and Q components).

Furuya does not teach that the second modulation signal is used as a pilot signal to derive the amplitude and phase distortion amounts of a receiver.

Alamouti et al. teaches a communication system, wherein pilot symbols are inserted in the QPSK symbols to be transmitted (col. 15, lines 42-48). The pilot symbols are used to provide an accurate representation of the channel response, i.e. the amplitude and phase distortion introduced by the communication characteristics (col. 12, lines 58-63).

It is known in the art that the channel distortion needs to be estimated and removed or compensated in the receiver such the received signal can be accurately demodulated to recover the transmitted data. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide pilot symbols in the QPSK signal of Furuya to estimate the channel distortion, such that the received signal can be accurately demodulated to recover the transmitted data at the receiver.

Regarding claims 42-44 and 53-55, Furuya teaches that the second modulation is QPSK (50 in Fig. 4).

Regarding claims 46, 47, 57, and 58, Furuya teaches that the first modulation is 16QAM (40 in Fig. 4).

Regarding claims 48 and 59, Furuya not particularly teach that a distance between signal points of the 16 QAM in an I-Q plane is equal to a given value (such as 2 or in a range of 0.9-1.5) times a distance between signal points of the PSK in the I-Q plane. However, it is clear the distance between signal points of the 16QAM or QPSK

in the I-Q plane in the system of Furuya is merely an arbitrary design choice, dictated by system conditions such as how noisy the system is. When there is more noise, the distance between signal points would need to be wider to reduce error.

11. Claims 40 and 51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Furuya (US Patent 5,577,087) in view of Alamouti et al. (US Patent 5,933,421) as applied to claims 38 and 49 above, and further in view of Wong (US Patent 5,027,372).

Furuya in view of Alamouti et al. teaches all the subject matter of the claimed limitation except that the PSK modulation is differential phase shift keying (DPSK). However, DPSK is a well-known variation of basic PSK modulation technique. It has been long practiced in the art. Wong teaches that the use of DPSK instead of PSK would have the advantage of not needing to transmit a phase reference (col. 2, lines 25-26). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use DPSK instead of PSK in the system of Furuya, such that a reference phase is not required.

Response to Arguments

12. Applicant's arguments filed 5/9/03 have been fully considered but they are not persuasive.

With respect to the Furuya reference, the applicants argue that *Furuya does not teach "regularly subjecting an input digital for first and second modulation ..."*. Whereas

the present application describes a system for alternately interleaving QPSK and APSK signals, the Furuya reference appears only transmits one or the other, depending on the signal conditions.

Examiner's response -- In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., alternately interleaving) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). According to Webster's Collegiate Dictionary, tenth edition, the word "regular" is *formed, built, arranged, or ordered according to some established rule, law, principle, or type*. In the Furuya reference, the data signal is subjected to 16QAM or QPSK modulations according to an established rule (i.e., whether the average reception signal level exceeds a preset value or not). Therefore, Furuya meets the claimed limitation. Further, in response to the argument that the Furuya reference only transmits one or the other, the applicants are reminded the present application also only transmits a QPAK signal or an APSK signal at a time.

With respect to the Seki reference, the applicants argue that *the system described in Seki, makes use of a null symbol generator. The null symbol appears in each frame, and corresponds to a pilot symbol. The receiver in Seki utilizes the reference symbols to correct for amplitude and phase variations. Thus, the modulation requires separate reference symbols, additional to the QPSK information symbols. On the other hand, in the present invention, only the second modulation signal is necessary*

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for demodulation. The first symbol in each frame is used as a pilot signal, and no other reference signal is needed for demodulation of the frame.

Examiner's response -- The applicants are reminded that the applicants only claim using the second modulation signal as a pilot signal. The applicants never claim "*only the second modulation signal is necessary for demodulation*". In the Seki reference, the QPSK signal is used to detect the variations in amplitude and phase errors of a received wave (see col. 13, lines 25-26, col. 13, line 55 through col. 14, line 5). Therefore, the QPSK signal is clearly a pilot signal and meets the claimed limitation. Moreover, with respect to the issue of "*only the second modulation signal is necessary for demodulation*", the applicants are reminded that the present invention also transmits a reference symbol (see, for example, 12c in Fig. 2). The reference symbols are used in acquiring synchronization between the transmitter and a receiver during an initial stage of signal transmission (see page 19, lines 21-24 in the specification of the present invention). Initial synchronization such as carrier recovery (that is, locking the local clock to the carrier) is an essential step of demodulation in a receiver. Therefore, it is clear both the reference signal and the second modulation signal (pilot signal) are required for demodulation in the present application. The argument of "*only the second modulation signal is necessary for demodulation, ... and no other reference signal is needed for demodulation*" is deemed to be incorrect.

Allowable Subject Matter

13. Claims 1 and 3-13 are allowed.

14. The following is a statement of reasons for the indication of allowable subject matter:

Claims 1 and 3-13 are allowable over the prior art of record because the prior art of record does not teach or suggest the limitation "the at least 8-signal-point modulation assigns logic states of the input digital signal to respective signal points for a first symbol in response to a signal point used by a second symbol of the phase shift keying which precedes the first symbol."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chieh M Fan whose telephone number is (703) 305-0198. The examiner can normally be reached on Monday-Friday 8:00AM-5:30PM, Alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Chin can be reached on (703) 305-4714. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9314 for regular communications and (703) 872-9314 for After Final communications.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-4750.



Chieh M Fan
Examiner
Art Unit 2634

cmf
July 24, 2003